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ABSTRACT

Case studies were conducted of four female cooperative education (co-op) students who participated in two 4-month co-op placements in a veterinary clinic as part of a high school biology credit. Two graduate students gathered data onsite during two phases: an initial 2-month period that oriented the methods of the inquiry at the clinic to match what was witnessed and observation and data collection during the last 2 months of the first placement and the second placement. Early in their placements co-op students learned simple tasks they were expected to complete without supervision. Assuming such responsibilities made them immediately feel like contributing team members and motivated them to complete the tasks proficiently so they could later be available to observe and participate in animal treatment. Students learned the relationship of the routines to the clinic's priorities and the science behind the activities in which clinic personnel engage. Two main types of opportunities for learning were tasks they performed and activities they observed and participated in peripherally. Clinic staff enhanced learning through questioning in the context of direct observation, think-alouds, cueing, and direct instruction. Two features of these approaches were that they reflected priorities of the clinic and they took place in the context of experience. The gradation in responsibility had dimensions in the workplace: complexity of tasks and responsibilities, risk if errors are made, and subject matter undergirding placement activities. (Contains 15 references.) (YLB)

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# CO-OPERATIVE EDUCATION: STUDIES OF LEARNING FROM WORKPLACE EXPERIENCE[1]

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## Introduction

This paper is concerned with co-operative education. This part of the secondary-school curriculum is named for the co-operation between schools and employers. It involves students spending part of the school day in a workplace setting for extended periods of time while enrolled in full-time study. Typically, students also engage in classroom orientations to the workplace and in reflective seminars. Co-op education is extensive. For instance, we have estimated that 10% of Canada's 1.55 million secondary-school students enroll in co-op education each year (Munby, Cunningham, & Chin, 1998). Oddly, there is hardly any research literature on this portion of the school curriculum, suggesting to us that nobody is asking curriculum questions about co-op education, such as the sort of learning that it can provide or about how this learning might be enhanced. This paper reports on a recent study of co-op experiences in a veterinary clinic from the perspective of learning in the workplace.

The paper opens with a brief statement of the background to the research and then provides an outline of the theoretical framework that informs the research we have conducted at the veterinary clinic. This is followed by a description of the setting and of the data collection approaches used. The text then turns to how the data suggested theoretical approaches to workplace learning that hold promise for thinking in terms that might be useful from the perspective of curriculum and of enhancing students' learning within workplace settings.

## Background to the Research

The background to this research lies in the disparity between the extent of co-op education in secondary-school programs and the amount of research directed at such activities. As we have already noted, enrolments are substantial (e.g., "Enrolment in Co-operative Education," 1998) but research in the area is minimal. A recent systematic literature search identified a study of workplace socialization (Simon, Dippo, & Shenke, 1991) and a multivariate study showing no significant effect of co-op placement on scores on career maturity (Varner, 1994). The paucity of research information on co-op education has a direct bearing on curriculum questions, from local instructional questions to policy questions at the district, provincial, and national levels (Munby, Hutchinson, & Chin, 1998). Among the questions that should be addressed are: "What is learned by students in co-op placements, and how is this learning assessed?" "How might learning from experience be understood so that it can be enhanced?" How might educators make the implicit curriculum of co-op education explicit in their interactions with students and with workplace supervisors?" And "What provisions are made in co-op placements for students with exceptionalities?" The obvious connection between co-op education and career education makes the development of reliable information about workplace learning even more urgent.

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We have initiated a program of research at Queen's University to establish a knowledge base for education about the world of work. One strand of this research program concerns identifying a theoretical framework for studying learning in the workplace. As shown below, some theoretical frameworks are currently available. But none quite suits the need for a theoretical approach that can guide instruction and assessment for the kind of workplace learning that secondary-school students might encounter in co-op education and career education. This paper is part of this strand of the research program.

Although co-op education credits are taken by a significant number of secondary-school students each year, this portion of the curriculum has received scant attention in the research literature. As shown in the following section, there has been an increase in research on workplace learning itself, but this research has been driven by a focus on the organization, its structure and function, and most of the research is with adult learners. Very few studies on informal and workplace learning pay heed to the relationships between learning, knowledge, and experience, and fewer (if any) consider co-op education placements.

## Theoretical Framework

A major part of the early work in this research program has been the identification and modulation of theoretical frameworks. A search for theoretical and empirical research on workplace learning was initially discouraging. For example, Berryman (1993) found that although studies on informal learning are "critical to the current enthusiasm for work-based apprenticeships, [they] are so few as to preclude a review of any length" (p. 345). A strand of research in workplace learning was developed by Marsick (1987). Marsick defined workplace learning as involving "reflection by individuals and working groups upon their own experience as part of the organizational whole" (p. 3). Marsick argued that learning in the workplace involves negotiation between participants about setting and achieving goals, and about roles and responsibilities. Watkins and Marsick (1992) extended this approach to learning in organizations by identifying four distinct learning types: informal learning, formal learning, incidental learning, and non-learning. They defined learning in the presence of both action and reflection as informal learning, and in the presence of reflection but absence of action as formal learning. Absence of reflection in the presence of action was defined as incidental learning, whereas the absence of both reflection and action was defined as non-learning.

This approach seemed to us to be less well-suited to learning in co-op education settings for several reasons. First, the research was directed at adults rather than at adolescents. Second, the approach was concerned for the workplace alone, whereas co-op education involves the students in in-school instruction also, so roles and responsibilities are different. Third, Marsick specifically distinguishes workplace learning from education, when co-op education clearly has a role to play in educating adolescents about the world of work. The theoretical framework needed for our research must satisfy a number of criteria, many of which are closely related to the educative potential of co-op education in the secondary-school system. That is, the theoretical approach must admit a consideration of the workplace experiences as curriculum. So the importance of the experience, of the planning, and of the instruction provided by those at the workplace must be visible in the framework. Equally, the framework must recognize the special character of experiential knowledge, and must provide a cognitive perspective on learning in experience that will permit the research team to identify what features of instruction promote learning and can be incorporated into instruction that could enhance workplace learning.

Although the framework needs to allow a focus on the learner in the workplace, it must also allow the research team to understand a basic tension we noticed in our studies of the veterinary clinic: the primary goal of the workplace setting is not learning, although the primary goal of school is. In the veterinary hospital, the goal is patient health and recovery and the activities are centered around this goal, while teaching is a subsidiary goal. In classrooms, of course, the purpose is learning and activities tend to be aimed in that direction. Activities directed at patient health and recovery are the routines of the hospital, and the effective participation of all concerned within these routines is paramount.

Lave's (1988) text on situated cognition and Lave and Wenger's (1991) work on situated learning and legitimate peripheral participation seemed useful to the task. This approach allows us to include the research of Bandura (1986) and others on observational learning and action representations. Also useful is Schön's (1983) argument that knowing-in-action is a legitimate form of knowledge, and the derivative view that experience itself has an authority

(Munby & Russell, 1994). The data considered below are used to illustrate how these frameworks offer insights into workplace learning within a co-op education context. The analysis shows how the theoretical framework has promise for informing a systematic study of learning and teaching in a co-op education setting.

## Methods of the Case Studies

### The Clinic Setting

The research was conducted as case studies of four co-op students in their placement, a "small animal" hospital (also referred to as a veterinary clinic) that has operated in its current location for approximately a decade. The building contains a spacious reception area, the veterinarian's office, space for dog grooming, four small examination rooms, six dog runs, an isolation ward, a laboratory, an x-ray room, a preparatory room, a surgery, and a surgical ward. Most of the data gathering occurred in the preparatory room and the surgery with the remaining observations and data gathering occurring in the surgical ward or laboratory. Since the examination rooms are very small, we did not attempt to observe at these locations.

The veterinarian, Bill[2], founded this clinic and has practised there ever since. He specializes in the care of house pets, mainly geriatric dogs and cats. He has arranged his practice so that the scheduled clinic appointments and the scheduled surgeries take place in the morning. The afternoons are left for walk-in traffic. We collected data during the mornings to coincide with co-op student placements and increased clinic activity.

### The Clinic Personnel

The clinic personnel include the veterinarian (Bill), two veterinary technicians (Kelly and Jill), and an animal-care aide (Sue). Although clinic personnel make up the clinical teams, not all were typically present at any one time. Surgical teams, for example, were mostly composed of three people: the veterinarian, the animal-care aide, and a co-op student or veterinary technician. The members of the surgical team were responsible for discrete aspects of the surgical routine: Bill performed the surgery, Sue assisted Bill, and the co-op student or veterinary technician managed the anesthetic machine. The animal-care aide and the veterinary technician could interchange roles but Bill and the co-op students did not change their respective team functions. During less complex procedures (e.g., teeth cleaning, or induction anesthesia) a veterinary technician and the animal-care aide might comprise a clinical team. If a co-op student was present who was at an appropriate level of trust, she might replace one of the staff. Rarely were there situations where two veterinary technicians worked together or where three or more clinic personnel formed a team.

### The Co-op Students

Four co-op students participated in the two placements that comprise this study; each placement included two co-op students. In the first placement, Kate and Ruth participated in the study and in the second placement, Ann and Jane participated in the study. All four students were female and all four students were participating in the co-op education placement as part of a high school biology credit. Kate was in grade eleven, Ann and Jane were in grade twelve, and Ruth was in OAC. When we entered the clinic in the spring of 1997, Ruth was entering the clinic for her second co-op placement—she had spent the first term at this clinic. Kate, on the other hand, was entering the clinic for her first time. In the fall of 1997, during the second placement, we met Ann and Jane. Ann had been volunteering on her own during the summer, whereas Jane entered the clinic for the first time in mid-September.

The co-op students were added to the clinical teams on an as-needed basis, usually performing the duties of the animal-care aide. Co-op students at the beginning of their four-month placement are not trusted as much as co-op students nearing the end of their placement. The degree to which a co-op student fits in as a clinical team member appears to depend upon the clinic personnel's assessment of her performance.

[2] Fictitious names are used in this paper to refer to clinic staff and co-operative education students.

**The Clinic Routine**

What follows is a typical morning at the animal hospital. We say typical although each morning was, in some respect, atypical. Unforeseen circumstances, unusual cases, or unfortunate accidents occasionally altered the activity in the clinic but the staff always guided things back to an established routine. This routine provided structure and predictability for us and for the co-op students. We try to capture the flavor of that routine by presenting a typical morning.

Co-op students arrive at the clinic each morning between 8:30 a.m. and 9:00 a.m. The first student arriving goes to the dog runs and takes each animal out for a walk. The second student arriving has the job of cleaning the dog cages and replenishing food or water supplies. This usually requires about twenty minutes. When they are finished, both co-op students go to the surgical ward to read the charts of the animals slated for surgery that morning. Sue often helps them with this by providing anecdotes and advice about animals and the impending surgical schedule. At this point, if clinic business is brisk, the students go to the front of the clinic to help Bill and Sue in the examination rooms with daily consultations. These consultations involve the animal, the animal's owner, Bill, and a co-op student. Often, Sue or Kelly is also present in the room. When a student is present, she is required to hold the animal, assisting Bill while he examines and treats the patient. If the clinic business is slow, the students check a work list and complete housecleaning tasks that are outstanding. The staff regards student initiative in this respect as a praiseworthy quality.

During the morning consultations, Sue also prepares for the morning surgeries. If there is more than one patient, she guesses at the surgical order and instructs the co-op students accordingly. The students prepare the appropriate equipment and resources for the surgeries. Bill often enters during this time; he affirms the surgery order then administers an induction anesthetic (made from a ketamine and valium mixture). He waits a few moments to make sure that the patient is in no danger and properly attached to the anesthetic machine before returning to the examination rooms for the concluding morning consultations.

Sue and one or two co-op students prepare the surgery and monitor the anesthetized animal. Bill enters, prepares very rapidly, and begins. Sue assists Bill by monitoring the students and making sure that the correct equipment is functioning, sterilized, and available for Bill. One co-op student (mostly Ruth in the first placement and Ann in the second placement) manages the anesthetic machine during surgeries. The other co-op student (mostly Kate in the first placement and Jane in the second placement) is not part of the team and watches the surgical procedure.

When Bill is finished closing a patient he hands control over to Sue, expecting that she will supervise the cleanup. Bill leaves and Sue and the co-op students remove the anesthetized animal to the recovery ward and wash the instruments, drapes, and gowns. After cleaning and disinfecting these, the co-op students are involved in assembling surgical packs for sterilization in the autoclave. Bill may return to do another procedure and the students may be involved in cleaning up more surgeries but the pattern remains the same. Often, it is 11:00 a.m. before the students have finished what they are doing and they have to leave.

**The Researchers/The Study**

Two graduate students gathered data on-site. Both graduate students had completed a graduate level qualitative research methods course but otherwise had no experience gathering data in the workplace. Data gathering occurred in two phases: an initial pilot phase during the first placement (spring 1997); and a study phase during the first and second placements (spring and fall of 1997). We discuss these below.

In the spring of 1997 we entered the veterinary clinic very naively. We wished to study workplace learning but, when faced with the actual setting, we had trouble framing suitable research questions to focus our research and, consequently, our methodology. Moreover, since no one in the research team is a veterinary doctor, the procedures, diagnostic practices, equipment, clinic language, routines, and expectations were as new to us as they were to our high school co-op student participants. This initial study period, lasting two months, oriented the methods of our

inquiry at the clinic to match what we were witnessing. We used this period as an opportunity to develop a framework grounded in the activity of the clinic. For the last two months of the first placement and the entire second placement, we used what we had learned during the pilot phase to guide observation and data collection. This is discussed in a companion paper (Chin, Munby, & Hutchinson, 1999).

## Data Presentation and Analysis

### Early Days in the Clinic

Extracts from the data of the first few days at the clinic, September 16 and September 18, are useful for how they show the introductory learning, and the purposes of this learning. The tasks that the co-op students were expected to learn early in their placements included some simple tasks that were to be built into their daily routines. On the first day of the placement, the students are told about the job list that they were to work their way through once they arrived at the clinic. This included feeding animals in the kennels, cleaning cages, filling water bowls, and taking the dogs out for walks. The students were given these responsibilities early on, and they were expected to complete them without overt supervision. Assuming such responsibilities had two effects. First, it made the students immediately feel like contributing team members engaged in tasks needed for the clinic to function. Second, it motivated the co-op students to complete these tasks proficiently so that they could later be available to observe and eventually participate in the more interesting aspects of a clinic—namely, the treatment of animals.

Expected tasks were introduced early on, and were followed by numerous exposures to these tasks to reinforce them through repetition. In the example of learning the task of preparing spay packs, the co-op students were introduced to the required cleaning techniques for surgical equipment and the need for maintaining sterile fields. Within the learning associated with preparing a spay pack, a series of gradual steps are implicitly used. These include: (a) showing the students the location of the soap and instructing them on which brushes to use (and which ones not to use), (b) showing the students how to remove scalpel blades during the cleaning technique, (c) instructing the students on which surgical tools (including the names and functions of these tools) go into a spay back, and which ones are put in a "cold" sterile pan, (d) instructing the students how to clean and fold surgical gowns, and (e) showing the students how to properly fold the sterile pack and prepare it for autoclaving.

For example, on the first and third day, students receive detailed instruction and demonstration so that they can learn the many steps associated with the preparation a spay pack, including ways to remove blood and tissue from drapes. The direct instructions included the following:

> Using cold water it [blood, tissue remains] comes off the drape easier (Sue, September 16, 1997).

> Then you have the cutting instrument that removes the claws. Do you have the instrument that holds the claws so they can be removed? That's your Rongeurs. If you think you are missing something from a pack like this, go through and remember how the [procedure] is done (Sue, September 18, 1997).

It is particularly important to note that the learning here is within a setting that has absolutely clear goals, although these goals are not learning. The goals of the clinic are twofold: (a) the comfort and health of the patients (the animals) and (b) making money. Importantly, while student learning is part of the co-op education placement it is not high on the list of priorities for the team at the clinic. Yet it is evidently important for the students to learn how the tasks they perform contribute to the priorities of the clinic. Maintaining a sterile field is clearly significant to all work in the clinic, and preparing spay packs is part of that. Equally, re-using drapes as much as possible contributes to the financial viability of the clinic, as do other cost-saving measures introduced to the students.

**Getting Closer to Science**

The placement in the clinic is a secondary-school science placement—specifically a biology one. It could be argued that the students' early learning of routines is relatively remote from science. But the students are also learning the relationship of the routines to the clinic's priorities. In addition, there are numerous opportunities for students to learn the science behind the activities in which others at the clinic engage. For example, on the first day at the clinic, Kelly calls Ann and Jane over to watch her do a urinalysis. Kelly explains what she is doing and introduces the students to the refractometer and how to make readings from it. She does the same with the dipstick test for glucose.

> Now we have the dipstick…each spot is colour coded and reacts with urine. So the first line is leukocytes so there are some white blood cells in there. Notice the colour on that bottle? It means that it is halfway between the colours…the pH is…there, it is 7.5…and the next means there is lots of sugar in the urine (Kelly, September 16, 1997).

It is noteworthy that during our next visit to the clinic, again Kelly was again engaged in a urinalysis, and she used this opportunity both to reinforce the learning from the previous day, and to assess if Ann and Jane had understood. Regardless of whether the co-op students were being exposed to expected tasks or associated activities, in both instances repetition is an important feature. Repetition of the event in the workplace is the mode of learning that replaces the role of notetaking that occurs in the regular classroom. The following examples illustrate this phenomenon:

> Kelly asks Ann, "What's this called?"
> "Refractometer," Ann replies.
>
> "If it's really low do you remember what I said it would mean about the kidneys?" Kelly asks.
> Jane ventures, "That it's…"
> Ann interjects, "There is lots of water."
> Kelly replies, "Yeah…it means that they are not concentrating their urine." (September 18, 1997.)

**Deliberately Limited Participation**

There are two main types of opportunities for learning for the students in the veterinary clinic. The first type of opportunity occurs in tasks that the co-op students are expected to learn as part of their placement. These include gradual increases in taking responsibility for activities like cleaning up, re-stocking materials, preparing spay packs, monitoring the anesthetic machine, and restraining animals. The second type of opportunities for learning occurs in activities that are part of the day-to-day operation of the clinic, but are not intended to be responsibilities for the co-op students (because of legal issues, safety issues, or licensing issues associated with such tasks). The co-op students are invited to watch and peripherally participate in associated activities such as blood analysis, blood type matching, x-ray developing, and urinalysis.

Although the students are quickly given responsibility for some routines, their participation in others is more gradual. We have already described the central role played by the anesthetic machine. Quite obviously, the early weeks in the setting allow the students to observe the procedures for working and monitoring the machine. It is not until later that they are permitted to increasingly assume responsibility for how the machine functions in procedures. Similarly, they are gradually allowed to perform minor procedures on patients, but always under the clear direction of a member of the clinic's team. For instance, when one of the students was applying the eye ointment to a recently anesthetized dog, the veterinarian tells her that she is going too close to the cornea with the applicator. "Don't touch the eye with that. Let it fall, let gravity do its thing. Okay? If you scratch the eye you will cause an eye injury," Bill explains (April 24, 1997). In this episode, the student is given directions to alter her activity because the implications for safety of the animal are paramount.

Only the veterinarian may perform procedures within the body cavity, yet surgical procedures are the occasion for the students' learning despite their limited participation. In these cases, the learning is visual but it is most clearly related to fundamental principles of good veterinary practice, such as maintaining the aseptic field. And in some cases, the students may not have even noticed the technique. For example, toward the end of one surgical procedure, the veterinary technician asked the co-op students if they knew why the veterinarian cut off and discarded the first six inches of sterile suture before closing the surgical incision. As both students were aware of neither the procedure nor the rationale, the veterinary technician proceeded to explain the practice to them. (To ensure that the suture was sterile.) The guided questioning by the technician provided the co-op students with an opportunity for learning that was enhanced by the students' experience of the context in which the suture was required (Kelly, March 26, 1997).

**How Learning Was Enhanced**

The previous example shows how clinic staff used questioning in the context of direct observation as the basis for helping students learn. At other times, as above examples show, the clinic staff use think-alouds, cueing, and direct instruction. Two features of these approaches are worth noting. First, they always reflect the priorities of the clinic; and second, they always take place in the context of experience in some way or another. The significance of experience and the clinic's procedures are particularly evident in the example above in which Sue explains how she thinks about the procedure in order to remember the sequence of the surgical instruments within a spay pack. In all these cases, the learning is authentically tied to a clear purpose.

It is also interesting to see how in some cases, the students use customary strategies to help them learn. For instance, they quiz each other on the names of surgical tools. This standard technique for rote learning demonstrates how important rote learning is within the workplace: the veterinarian refers to instruments by correct names, so students, as team members, must know them if the priorities of the clinic are to be met.

## Discussion

As we have worked through the data, we have been mindful of the need for a theoretical approach that can serve instructional requirements. Specifically, our purpose has been to determine how we can explore workplace learning so that the instructional curriculum can be identified and then made explicit for learners. A theoretical framework that illuminates this is clearly important. As we argued earlier, the work of Lave and Wenger (1991), of Schön (1983), and of Bandura (1986) seem to have promise. The data analysis uses these perspectives and initiates the development of features of learning in co-op placements that suggest the beginning of a theory of curriculum and instruction for workplace learning.

A starting point in that theory would be the recognition that goals are different. In the clinic, as in other workplace settings, the goals differ from those of school in which student learning is the priority. This leads to a recognition that the authentic character of workplace learning seems to be most readily apparent to students when the goals are made explicit for them. The tasks and routines that are to be learned are then explicitly directed at meeting these goals. This feature of the workplace is interesting because it suggests that the distinction between formal and informal learning advanced by Watkins and Marsick (1992) among others, is not as helpful as a distinction between authentic and inauthentic learning. In our analysis, authentic learning is seen as learning directed at achieving a goal that is transparently significant to the setting in which the learning is occurring.

A feature of the experience offered by the clinic is the gradation of tasks and responsibilities. None of these tasks is simply menial even though cleaning out the runs might initially appear that way. This daily chore is part of the clinic's commitment to the health and well-being of patients, and it seems to be recognized as such by the students. Further, participation in the task provides students with a clear role within the functioning team, and it is clearly a precursor to assuming responsibilities for more significant tasks as they are learned. Legitimate peripheral participation is accompanied by learning and by a gradation in responsibility. Importantly, this gradation appears to have several dimensions in the workplace we have studied.

1. The first dimension concerns complexity of tasks and responsibilities. Students begin with simple, familiar, tasks such as sweeping and cleaning and progress to more complex tasks.

2. The second dimension concerns the risk if errors are made. Tasks and responsibilities given to students seem to begin with those where errors are less threatening to the health of patients. Tasks that are assigned later are those in which errors would be graver.

3. The third dimension concerns science (in this workplace), or any subject matter undergirding the activities of the placement. Tasks seem to be ordered according to the extent and complexity of he science implicit within them or underneath them. For example, walking dogs has little connection with science in contrast to urinalysis, which has a much closer dependency upon science.

An interesting feature of this third dimension is that it begins to undercut the customary distinction between "knowing how" and "knowing that." The "knowing that" of science acquired in the clinic is clearly learned in the service of "knowing how." The intimacy of this connection is apparent in the workplace where learning is geared to the clinic's goals. It may be less apparent to learners in schools where the goal is further removed and the learning may seem to be inauthentic. Conceivably, the distinction between knowing that and knowing how has currency only in settings where the learning is inauthentic. We intend to explore this issue in later studies.

A final feature of the team at the clinic, which is evident in the analysis, is the range of teaching approaches employed by the clinic staff. They teach by questioning, by cueing, by showing and demonstrating, and by thinking aloud. All the teaching seems carefully graded and attached to experience. And scaffolding is evident in the routines that are progressively acquired by the students. In an earlier paper, we discussed the staff's approach to assessment (Chin, Young, & Munby 1998). It is clear that a theory of curriculum and instruction in the workplace will need to incorporate the gradation implicit in assessment. Our further studies will explore the role of assessment just as they will address the hypotheses implied in the three dimensions given above. Our hope is that statements like these can be incorporated into a theory of curriculum and instruction that can be used to enhance the co-op and career education experiences of students in workplace settings.

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